**3.1 Absolute and Relative Max/Min Values**

1. In your own words, describe the conditions that produce critical numbers. (Where do they occur?)

2. Describe the difference between relative and absolute max/min values.

3. Can you think of a time when an extreme value would occur at a number that wasn’t a critical number?

4. Give an illustration of a non-linear function that has no max or min. Describe what makes the function not have a max and min.

5. Give an illustration of a function that has a minimum at a critical number where the function is not differentiable.

**For the following functions, find the critical numbers.**

**6.** *on the interval* **7.** *on the interval*

**8.**  **9.**

**10.**

11. Graph a function on the interval that has the following characteristics:

a. *absolute max at x = -2*

*b. absolute min at x = 1*

*c. relative max at x = 3*

12. Suppose Harps Foods Store has determined that the cost (C) or ordering and storing (m) units of milk can be modeled by the function , as long as because the delivery truck can bring at most 300 gallons of milk per order. Find the order size that will minimize cost for Harps.

13. Could the cost be decreased if the truck were replaced with one that could bring 400 gallons? Explain what the new order size would be.

14. T/F (explain if false) The absolute maximum of a function that is continuous on a closed interval can occur at two different values on the interval.

15. T/F (explain if false) If a function is continuous, then it must have at least one minimum.